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Annual Report on the Agricultural Department, Nigeria, 1943

POLICY

This report should again be regarded as a supplement to the two half-yearly Production Reports which have been submitted separately. There has been no change in the fundamental policy underlying the work of the Department. Its application has, however, been continually modified in the light of experiment and actual farming experience, and there have in recent years been considerable developments particularly in connection with animal husbandry, methods of extension work, and the study of peasant economy through the medium of unit farms. Certain aspects of our policy have recently been somewhat severely criticised particularly in regard to our insistence on the need for full experimental proof of the soundness of advice offered to farmers, and to the resultant somewhat slow tempo of our extension work. But recent experience with production drives, and the comparative failure of more spectacular methods have more than justified this policy. The increasing evidence, which becomes more and more obvious every year, that the Department has gained the confidence of the producers is most gratifying. We are quite confident that when we can build up an adequate staff of both European and African Agriculturalists to meet in full the needs of the country, progress with our main lines of work will be extremely rapid. The training of African Staff has always been regarded as of fundamental importance and there has been no slackening of effort in this matter as a result of the war.

2. Throughout the year the Department continued to concentrate its main efforts on securing maximum production. The experience of the last year or two tends to confirm that in a country of the size of Nigeria with its diversity of soil and climate the best results are obtained by going all out for the maximum production of all crops, and the retention of a proper balance between the crops produced for export and those required for local consumption rather than by concentrating entirely on one or two export crops. The internal trade of Nigeria is very nicely balanced, and experience has shown that it is unwise to upset this balance. The above was the essence of the production policy which was submitted to the Government by this Department in September, 1939, before the commencement of hostilities, and at the same time a suitable organization of the Department to enable it to be carried out was also suggested. This organization was adopted as soon as the war broke out and has remained in operation ever since.

3. The Research Officers have again been mainly engaged on work in connection with production but a surprising amount of useful research has been done, and the Officers whose function it has been to keep it going are to be congratulated on what has been accomplished. Since the outbreak of the war a great deal of effort has been put into the development of local village industries and the processing of crops and in some cases the results have been very promising. There is no doubt whatever that the whole staff is beginning to feel the strain of the arduous work which it has been called upon to perform during the last few years and it seems likely that a period of marking time is being forced upon us. During the last two years the Department has been provided with adequate funds for the staff available, and further progress is now dependent on the provision of more staff. This is especially true of research work.

ARMY SUPPLIES

4. Until February, 1944, the Department had been largely responsible for Army Supplies and for this work it received the thanks of the General Officer Commanding in Chief. The rapid growth of the army during the early days of the war caused many

difficulties and much very hard work for the Agricultural Staff but these difficulties were gradually evercome and the organization finally set up under Dr Bryce worked smoothly and met all demands for both the Army and the minesfield. Its success was largely due to the co-operation so willingly given by the Provincial and Native Administrations. A full account of the supply work has already been submitted to the Government in a separate report by Dr Bryce who, I regret to have to report, has now retired on pension. Dr Bryce during his tenure of office did magnificent work for Nigeria and his retirement is a great loss to the Department. Supply work, with the exception of the cattle supplies connected with the Army's reserve herds, has now been handed over to the Supply section of the Secretariat.

THE 1943-44 SEASON

5. 1943-44 can fairly be described as an average season throughout the country. This is particularly well illustrated by the following figures from Daura :—

RAINFALL—TAMBU FARM DAURA

	April	May	June	July	Aug.	Sept.	Oct.	Total
1943	—	.98	2.97	7.1	11.30	2.59	.18	25.62
Average 10 years.	.12''	2.15	2.98	6.1	9.78	4.02	.21	25.35

As is usual in the Northern Provinces the early rains were uncertain and in some areas there was a dry spell between the first few storms and the onset of the real rains. The latter did not commence until towards the end of June in areas North of Zaria, and although some difficulty was experienced in getting corn crops established yields were excellent almost everywhere. Except in parts of the Kano area where the early rains were difficult and some of the groundnuts were planted late it was a satisfactory season for groundnuts, but as a result of the early cessation of the rains the cotton crop undoubtedly suffered : the effect was however to some extent mitigated by the late onset of the Harmattan. Both Adamawa and Bornu had an excellent season and yields of corn were above average. In the Benue Province, although the total rainfall for the year was up to average, bad distribution at planting time adversely affected the benniseed crop and production was disappointing. Throughout the Southern Provinces rainfall was on the whole slightly below average but crops were entirely satisfactory. The break in the rains during July and August was very marked.

LOCUSTS

6. In April, 1943, small concentrations of the solitary phase of the African Migratory Locust were found in irrigated wheat fields near Mongonu (about fifteen miles west of Lake Chad) ; no swarms of this species have been reported during the year. During late May and June there was an easterly migration of the Desert Locust across the belt lying between 12°N. and the northern frontier. For the first time in recorded history this species bred in Nigeria (in August). About 350 square miles in the north-eastern corner of Bornu and a small area in the extreme north of Sokoto were affected ; both areas were extensions of large scale hopper outbreaks in French Niger. Between 1st October and 11th December, there were twenty-seven reports of swarms of the new generation ; after that date no locusts were present in Nigeria until mid-March, 1944, when swarms entered Ilorin Province from the west. The easterly migration continued across Nigeria and swarms reached the Yola area in early April.

7. Fifty tons of sodium arsenite have been imported during the last two years, and preparations have been made for a large scale poison bait campaign against the hoppers.

In addition, a mobile unit is being assembled at Kano to deal with hopper bands in areas where baiting is impracticable on account of lack of population or water. This unit is being provided with wireless equipment, transport suitable for sandy areas, locust barriers, and spraying machines.

PRODUCE INSPECTION

8. For security reasons a full report on the work of the section with the usual statistics has been submitted separately as an appendix under a secret cover. In addition to the usual work of Produce Inspection there were heavy calls on this section of the Department, chiefly in regard to the numerous returns required in connection with the cocoa, groundnuts, palm oil and kernels, rubber and benniseed purchase schemes. Palm Oil bought for Army consumption was tested for F.F.A., and there was a scheme of inspection for rama fibre, although no regulations were applied. The grading of rubber was instituted during the year and the staff, including new staff, had to be trained to deal with this line of work.

9. Cocoa control regulations worked smoothly, and the crop was evacuated expeditiously. The figure for the main crop was the lowest for nine years. The percentage Grade I was 15.97 per cent. The quality of Palm Kernels presented for examination was good, but total gradings were rather less than those of the 1942-43 season. The price paid for all grades of palm oil was increased in February, 1944, and the method of purchasing was revised, five grades being established based on the percentage of Free Fatty Acid. The total quantity passed for export was less by 12 per cent than in the previous year.

10. The groundnut season opened on 18th October, 1943, and closed on 30th March, 1944. A price was fixed at line stations, with a minimum price at remote stations subsidies being paid where the difference between the price at line stations and that at remote stations did not cover cost of transport. The season was favourable, and although yields per acre were generally satisfactory the total quantity of nuts purchased for export was slightly below the average of the last fifteen years. The quality of the crop was good and there were no cases of deliberate adulteration—average impurities amounted to 0.283 per cent.

11. The cotton crop in the Northern Provinces amounted to 17,200 bales of 400 lb lint, as compared with 24,700 lb in the previous season. The low purchases are partly due to weather and partly to restrictions placed on cotton growing in Northern Sokoto and Northern Katsina, but probably the main factor was the competition from the local weaving industry. The price of seed cotton in the local markets was rarely below 2d per lb and frequently as high as 3d per lb as against 1½d per lb in the export markets. Of the total graded, 10.1 per cent was Grade II as compared with 5.7 per cent in 1942-43 season. The increase in Grade II was due to stricter grading, and the fact that much seed cotton was brought to the market tightly packed in locally made containers instead of in suitable bags, so that grading was difficult and doubtful cases were graded as second grade. Both the Zaria and Funtua ginneries reported that the ginning percentage of lint to seed was this season higher than usual, the Zaria figure being 23.8 per cent and that of Funtua 32.34 per cent.

12. In the Southern Provinces no cotton was graded until March. The standards of grading were much stricter than last year, especially as regards leaf and foreign matter. The cotton presented for examination was exceptionally dirty due to very heavy rains and high wind unusually early in the year before the cotton was harvested. Of the cotton

presented, 60 per cent had to be rejected for cleaning. Total purchases of Ishan cotton amounted to 3,500 bales of lint and of Native cotton 2,300 bales of lint. The output of the Lokoja ginnery was 980 bales.

13. The gradings of cassava starch for April, 1943, amounted to 979 tons. The export of starch was prohibited after 30th April, 1943. Practically all the starch was from areas in the North of the Warri Province where starch making was becoming quite an important industry. Samples examined by both the Imperial Institute and by commercial concerns received very satisfactory reports, the dextrinising properties and the low percentage of protein and ash being commended.

14. Amendments to the Potato (Marketing and Export) Regulations, 1942, were introduced during the year in order that the regulations should apply only to potatoes exported from producing areas and not to potatoes consumed locally within these areas. Examiners were detailed for inspection, and the quality was reported to be generally satisfactory. Some of the potatoes railed South in unsealed containers were found to contain chats and this necessitated a further amendment of the regulations to permit of the seizure of such consignments and consequent prosecution.

15. The inspection of rubber commenced on 1st October, 1943, and the scheme was working smoothly by the end of November. Some amendments were made to the regulations as a result of experience gained. The following figures are an interesting indication of the quality of rubber graded :—

Plantation Rubber	*A I Sheet*	*A II Sheet*	*A III Sheet*	*C I Scrap*	*C II Scrap*	*B I Crepe*	*B II Crepe*	*Total*
Percentages ..	55.63	19.06	2.53	2.66	18.83	.51	.78	100

Wild Rubber	*A I Sheet*	*A II Sheet*	*A I Rope*	*A II Rope*	*C I Scrap*	*C II Scrap*	*C III Scrap*	*D I Ficus*	*D II Ficus*	*N Niger Gutta*	*Total*
Percentages	17.12	7.43	.11	.27	50.74	11.88	7.46	.82	.10	4.07	100

MARKETING

16. Towards the end of 1943 staff became available to enable a start to be made on the work of collating the information (collected in previous years) relating to the movement, of country produce within Nigeria. The many inaccuracies of earlier reports have gradually been ironed out and the data now available are considered to be sufficiently reliable to justify the preparation of a first report on market intelligence. It is anticipated that this report will be completed before the end of 1944.

17. The issue of a Monthly Bulletin of Market Information was continued. The number of commodities previously mentioned therein was reduced, and every effort was made to increase the accuracy of the information provided. Owing to the need for economy in stationery, the circulation was limited to 100 copies per month, but requests far in excess of this number continue to be received.

18. Trial sample consignments of Starch, Raffia Bags, Mats and Hats were sent to South Africa, but unfortunately the cargo was over-carried and delay ensued. Repeat orders have been obtained for Raffia bags and mats ; shipment cannot however be mad:

until 1944. The Military and Naval demands for many of our main products eased considerably during the year, but the Marketing Section was instrumental in obtaining for them supplies of potatoes, onions, vegetables, eggs, etc., either directly or by putting them in touch with reliable African and Syrian contractors.

19. The activities of the Showrooms were greatly expanded and the variety of articles displayed—both farm products and the products of local industries—was much greater. Our chief difficulty is the maintenance of an even flow of supplies of a standard quality and an enormous amount of time is occupied in finding and organising alternative sources of supply.

20. The Chief Marketing Officer has also carried out a very full investigation into the vegetable and onion trades and has also investigated the best type of locally made container for these products. He has also been instrumental in marketing and popularising the excellent Arabica Coffee produced in the Bamenda area, for which the producers had previously been unable to find a satisfactory market.

ANIMAL HUSBANDRY

Policy

21. The general policy of the Department with regard to animal husbandry is still based on recommendations made by Dr du Toit as a result of his visit to Nigeria in 1927. An immediate result of this visit was the establishment of the Shika Stock Farm, with the object of improving the local breeds of livestock, particularly the cattle. Up to the present our main objects have been to improve both the conformation and the milking capacity of the local breeds. This has involved the working out and standardisation of a system of feeding and management which would enable the cows to develop to a maximum their inherent milking capacity, which in effect was largely the problem of providing an adequate and balanced supply of food during the dry season. Great progress has been made and the feeding tables which have been evolved are extremely satisfactory, at least for Nigerian conditions, but as a later paragraph will show, difficulties still arise from time to time.

22. The demand for milk and milk products which has been accentuated during the war fully justifies our policy of first of all attempting to improve the milk yield of the local cattle, but indeed this was also an essential preliminary to any attempt to breed for beef, as in beef breeds the dam must be able to feed the calf well during the first six to nine months of its life. We now have several proven milk strains and can go steadily ahead with our programme of breeding for milk. The success of the dairies which have already been started in the Southern Provinces shows that the market for milk is almost unlimited, and that every animal of a high yielding strain which we can produce will be required. Our attempts to improve conformation have also been extremely successful and the Shika animals are outstanding in any company. We are therefore now in a position to start selection for an improved beef type of animal. There has always been a limited market for specially fattened animals in the Northern Provinces which is catered for locally, but our experience during the war has shown that a demand for better quality meat is also gradually being developed in the Southern Provinces. The Agege fattening scheme is an attempt to cater for this demand by fattening the cattle as near as possible to the market, and if it is a success a real attempt to improve the local breeds from a beef point of view will be fully justified. It is also a logical development of our mixed farming scheme in the Northern Provinces for, after working his animals for a year or two while they are still growing, the mixed farmer can now sell them in good

store or partially fat condition, to be finally fattened in the Southern Provinces. Plans are now being drawn up for a very considerable expansion of our stock-breeding activities and both milk and beef will be catered for, while special attention will be given to the production of bulls of high milking strains, suitable for use with the nomadic Fulani herds.

23. Dr. du Toit recommended that the question of livestock for the Southern Provinces should be studied further as circumstances permit, but the real impetus for this closer study came from our greater realization of the need for a system of mixed farming for the Southern Provinces. In 1937 a stockfarm was started at Ilorin with a view to investigating the possibility of finding an animal of real economic value which was suitable for the conditions of the Southern Provinces, where tsetse fly and the resultant trypanosomiasis must always be anticipated. The local dwarf cattle are able to survive, but are so small as to be of little economic value, even as manure makers. In the N'Dama breed which was obtained from French Guinea a solution has undoubtedly been found for many parts of the Southern Provinces, and this breed either pure or crossed with the Zebu or local dwarf cattle will play an important part in the improvement of the cattle of both the Southern Provinces and many parts of the Northern Provinces ; for as a beef animal its conformation is greatly superior to that of any of the Zebu breeds. We are now investigating its possibilities as a milk producer and the results are promising.

24. In our cattle policy as far as the South is concerned we are working on two parallel lines, namely the use of Zebu cattle stall fed in fly-proof byres,—whether they are kept for meat or milk,—and the production of a type which can live under normal conditions. The adoption of the first method has enabled us to make immediate progress, while the second may probably be the ultimate solution although it is quite certain that for many years to come there will be room for both. Plans for expanding the Ilorin scheme have been drawn up and also plans for a similar scheme for the Eastern Provinces, but our immediate need is for more N'Dama cattle. This will however have to wait until after the war.

PROGRESS OF MIXED FARMING, NORTHERN PROVINCES

25. The introduction of mixed farming continued to make satisfactory progress, but since the outbreak of the war the preoccupation of all members of the staff with production schemes has left little time for the setting up of new farmers or the supervision of the existing ones. This lack of supervision has however shown conclusively that we now have a nucleus of sound farmers who are firmly established and can hold their own with very little assistance from us. The total number of farmers on our books who have received advances is now 2,123, as compared with 1,960 a year ago. During the year 406 new men were set up while 243 dropped out. Of the total remaining, 1,530 are genuine peasant farmers. As explained in last year's report the fact that a certain number have fallen out does not mean that they have given up mixed farming entirely. Losses from disease continue to be a limiting factor, but as a result of several years' experience we now know those districts which under present conditions are unsuitable for mixed farming. Higher produce prices have enabled the farmers to repay their advances without difficulty and of those still on our books 739 have repaid the whole advance or are in credit, and 764 owe less than £6.

26. The Misau Emirate has again been outstanding. In this area sixty-three new farmers were started during the year and there were only four failures. It is expected that over 100 new farmers will be started there in 1944. Progress has also been rapid

in the Anchau corridor and numbers rose from sixty-four to ninety-eight. It is confidently anticipated that when we have an adequate staff after the war progress will be extremely rapid.

27. The unit farm system has enabled us to make a very close study of both the various types of mixed farming, and ordinary hand farming. The unit mixed farm at Daura, for example, showed that the gross revenue from the twelve acres amounted to £15 4s 1d while the farmer's expenses amounted to £10 17s 5d. Of this amount £9 was the value of foodstuffs consumed by the family. At Gumel the farmer's income amounted to £13 9s, at Kazaure to £13 7s and at Taura to £29 11s. This higher figure at Taura was due to the sale of two fat bulls. The small unit farms at Kano which are adapted for the close farming area have also given interesting information, and have shown that a four acre holding is capable of maintaining a man, his wife and one child and a cow. On unit farm No. 1 consisting of four acres, and on which one cow is kept, the farmer's net income was £17 16s of which £5 8s was derived from the sale of milk. On these farms goats have not been a success. The economics of fattening a bullock on such farms is now being investigated.

CATTLE FATTENING

28. The Army reserve herds have again provided a market for the mixed farmer's fat and semi-fat cattle. By fattening his working cattle at the end of one or two season's work, the owner is able to make a handsome profit. The main difficulty in this system at present is that of obtaining suitable replacements in adequate numbers. The scheme has done a great deal to popularise mixed farming and has to some extent led to the establishment of the fattening scheme at Agege where the animals are finished off for the Lagos Market. In the half-year ending 31st December the Katsina and Daura mixed farmers sold 176 cattle to the Army and the Kano farmers thirty-three.

29. The Agege scheme was started in April, 1944, and it still remains to be seen whether it will be an economic proposition. The cattle are supplied by mixed farmers or from a reserve herd maintained at Samaru, and on arrival at Agege are kept in fly-proof houses. As supplies of feeding stuffs are available in the Southern Provinces all the year round, it should be possible to fatten the cattle much more cheaply than in the Northern Provinces and the loss of condition caused by the railway will be avoided. This scheme, if successful, will open up great possibilities for the improvement of farming in the Southern Provinces. A comprehensive series of slaughter tests is being conducted in co-operation with the Cold Store and, from the results obtained, we shall eventually be able to decide on the best type of animal for beef purposes, and arrange our breeding programme accordingly.

ARMY CATTLE

30. The Department has maintained reserve herds of cattle for the Army at both Bokkos and Daudawa. At Bokkos the herd consisted of 1,700 animals on the 1st October, 1943, and 2,770 remained on hand on the 1st April, 1944. During this period 3,100 were purchased of which 1,800 were sold to the mines. At Daudawa purchases amounted to 4,122 beasts of which 2,490 were railed. During the period 1st April to 31st December, 1943, the Department purchased over 14,000 head for the Army. There was a severe outbreak of pleuro-pneumonia in the Bokkos herd in January, 1944, and in spite of re-inoculation the disease became widespread throughout the herd. A similar outbreak has recently occurred at Daudawa.

SHIKA STOCK FARM.

31. A full report on the year's work has been submitted separately. The 1943-44 season was one of the most difficult the farm has experienced since it was established

fourteen years ago. The first rains were fully four weeks later than usual and although the fodders lasted until the end of April there was an acute shortage of grass and fodder during May. Milk yields dropped as a result. Last year's epidemic of calf scour persisted through the greater part of 1943, despite the continuous assistance of the Senior Veterinary Officer, and Research Staff at Vom. Prophylatic treatments showed signs of having a marked effect on the incidence of the disease towards the end of the year. The following stock were issued during the year : eight cows, forty-six heifers, twenty-two bulls for breeding purposes and four work bulls –making a total of eighty animals in all. During the same period ten Sokoto (Gudali) and thirty-two White Fulani cows were purchased for the Stock Farm. These are to be isolated for a year and tested for contagious abortion three times before being allowed to join the herd. At the first two tests two White Fulani and one Sokoto were found positive and were slaughtered.

32. The castration experiment started in 1937 (*vide* paragraph 51 of Annual Report for 1937) has been maintained and careful records kept of every animal. The animals are now fully grown and measurements show that the difference in weight of the two groups is very small indeed—the entires are 52 lb heavier than the castrated animals. But measurements also show that the effect of castration has been to produce a taller and more leggy beast, lighter in build and more triangular in the outline of the back.

33. The herd production averages for milk yields show a substantial reduction compared with those of previous years. Compared with 1942, the lactation average was reduced from 2,414 to 2,139 lb, and the pounds per day " between calves " index from 6.70 to 6.09. The decrease in yield is attributed to three factors. Firstly the early season drought denied the milking herd the usual fresh spring grazing in May. The milking cows lost some 60 lb, and the dry cows some 45 lb live weight during the month of May due to shortage of grazing. The milk yields fell off from the middle of April until the 22nd of May. An improvement took place after that date and reached a peak by 26th June. Secondly the yield averages for 1943 were compiled almost entirely from immature lactations (cows in their first four lactations) ; in previous years there has been an appreciable proportion of mature lactations (cows in their fifth and subsequent lactations) but these have all been sent to the dairies in the Southern Provinces. During the last two years seventy White Fulani and thirty-four Gudali cows have been so transferred. Whereas in 1942 of the recorded lactations 30 per cent were 4th and subsequent lactations, in 1943 the corresponding figure was only 6.2 per cent. The third factor is connected with the 1942-43 epidemic of calf scour, and the high mortality among the calves, as a proportion of the Zebu cows refuse to give milk freely except in the presence of their offspring, and when their calf dies a number of the cows dry off completely. It is impossible to assess accurately the relative influence of the above factors in the general decline of yield but in spite of them there were several outstanding lactations including one of 5,000 lb by White Fulani cow No. 200, one of 4,000 lb by Sokoto cow No. 133 and eight others of over 3,000 lb.

34. It is probably unnecessary to stress the fact that a cow does not attain to her maximum yield until her fifth and subsequent lactations. This is so generally accepted that standard correction figures have been adopted in many cattle breeding countries, to permit comparisons between " immature " and " mature " lactations. Whether or not the same corrections are applicable to Nigerian breeds under local conditions can only be determined after sufficient data has been accumulated at Shika. An examination of our records suggest that the time for this has not yet been reached. Tentative correction factors are, however, used in the calculation of Stock bull indices, and, even if not yet entirely reliable, they will give a more accurate assessment of annual herd

averages where there is an appreciable variation in the proportion of " immature " and " mature " records. The " Correction Factors " referred to are compared in the following table to the standard figures adopted in Great Britain :—

Lactation No.	*Correction Factors for Glen and McCandlish*	*Immature Lactations Shika White Fulani*
1	1.16	1.31
2	1.13	1.30
3	1.06	1.18
4	1.02	1.10
5	1.00	1.00

35. Following the precedent of recent years, the influence of the sire on the current performance of White Fulani and Sokoto herds, is shown in the following table :—

Dam's Sire	*No. of cows*	*Lactation (average)*	*Pounds milk per day between calves (average)*
WHITE FULANI HERD.			
Dams sired by S.B. 13, No. 2 strain ..	5	2,625.6	7.88
Dams sired by S.B. 14, No. 2 strain ..	9	2,408	6.94
Dams sired by S.B. 18	—	—	—
Dams sired by S.B. 4	5	2,263.4	6.94
Dams sired by S.B. 24, No. 4 strain ..	4	2,314	6.20
Dams sired by S.B. 21, No. 21 strain ..	7	2,043	5.96
Dams sired by S.B. 19, No. 19 strain ..	12	1,985.7	5.34
Dams sired by S.B. 20, No. 20 strain ..	2	1,553	4.53
Dams sired by S.B. 17, No. 17 strain ..	3	1,558	4.46
Dams sired by S.B. 12, No. 12 strain ..	1	1,137	3.45
Herd average	—	2,139	6.09
SOKOTO HERD.			
Dams sired by S.B. 7	1	2,724	8.30
Dams sired by S.B. 6	4	2,417.2	7.18
Dams sired by S.B. 12	4	2,670.5	6.44
Dams sired by S.B. 13	3	1,751.7	5.06
(Discarded Strains)	4	1,317.1	3.56
Herd average	—	2,186	6.21

Strain No. 2, and especially Stock Bull No. 13, still maintains its reputation for high milk yield, and claims five out of nine of the season's best lactations. It will be another year before the progeny tests of the last of the White Fulani purchased stock bulls, Nos. 20 and 21, are completed. Whilst several of No. 20's failures have already been culled, Stock Bull No. 21 has given the herd several good milkers, including one of the season's best cows No. 346.

HEALTH OF STOCK

36. The epidemic of calf scour was a major preoccupation in 1943 as it was in 1942. A preliminary investigation of Shika scour was initiated by the Veterinary Pathologist subsequent to his visit to the Stock Farm in April 1941, and before the disease had assumed epidemic proportions. Calves were railed from Shika to Vom at regular intervals throughout 1941 and 1942. Results of these preliminary investigations however were negative in respect of the isolation of the specific agents causing the disease, but a peculiar anaemia, thought to be associated with the disease, was brought to light. During 1942, on the advice of the Veterinary Department, various treatments were tried including chinosol, and nuclein, but no effective alternative to routine M and

B treatment was discovered. M and B appears beneficial only in a limited number of cases, and presumably may help to prevent secondary pneumonia.

37. Routine hygiene was tightened up in regard to utensils, and the washing of udders and hands before milking and feeding, but these measures had no apparent effect on the incidence of the disease. Scour is not invariably associated with bucket feeding, although the incidence is lower by 30 per cent in suckled calves. Flies are always numerous and were suspected of being the principal agent in the spread of the disease. One set of calf building was therefore fly-proofed as far as the inadequate supply of gauze would permit. Although fly-proofing was not entirely efficient the incidence of disease was reduced from 76.9 per cent in the open buildings to 52 per cent in the partially fly-proofed pens, and the mortality from 50.9 to 24.6 per cent. These figures appear to be highly significant. It has been suggested that fly-proof housing excludes the sunlight and that the calves do not get enough exercise, but the calves are normally kept in these pens for only twelve weeks and they are exercised within the pens from the age of five weeks.

38. At the request of the Veterinary Officer, Zaria, Mr Sprent, Veterinary Research Officer, Vom spent four weeks at Shika in March and three weeks in November, 1943, investigating the disease. His persistence and patience were rewarded by the isolation and the identification of the specific organisms for the first time in fourteen years, and their identity has subsequently been confirmed by Dr Henning of Onderstepoort. They are B. Coli (probably in very young calves) and Salmanella Enteritidis Var Dublin in older calves. Having isolated the organisms, Mr Sprent prepared from his mixed cultures Vaccine No. 1 before returning to Vom in April, and this sufficed to treat eighteen calves. A second vaccine, prepared at Vom, was used on all calves between 4th June and 6th November, 1943. A third vaccine is to be used as from February, 1944. Although no spectacular results are claimed, it is believed that the cumulative effects of the measures outlined above have been to reduce the virulence and incidence of the outbreak, and that steady progress in the right direction can be anticipated. Our thanks are due to Mr Sprent for his thorough investigations at Shika and at Vom.

39. The following are the comparative percentages for abortion and still born calves from 1937 to 1943 :—

1937 .. ..3.6	1938 .. ..4.7	1939 .. ..4.5
1940 .. ..4.6	1941 .. ..3.2	1942 .. ..3.3
	1943 .. ..8.9	

The large increase in 1943 can be correlated to the higher percentage of first calf heifers in the herd (of which six cows aborted) to new purchase (three cases) and to old cows in poorish condition (three cases including Sokoto thirty-one, our record cow, which subsequently died). All surviving cows were tested for contagious abortion.

40. Rinderpest immunisation of young stock was carried out in February and October by Double Inoculation, using attenuated goat virus. The numbers involved were :—

	February	*October*	*Total*
Yearlings	87	106	193
Young calves	129	101	230

The inoculations were invariably followed by marked temperature reactions, copious lacrymation and symptoms of scour. At the October immunisation, the mortality worked out at 8.9 per cent, being heaviest in the " under six months of age " class and especially in those calves which were in any degree unthrifty as a result of scour.

In view of this, and because contact infection does not occur with goat virus, it has been agreed with the Veterinary Authorities, that Double Inoculation will be withheld in future from unthrifty calves under six months. They will be permanently immunised as yearlings.

41. Twelve cases of trypanosomiasis were confirmed by blood examination, one of T. congolense and the others of T. vivax. In all, twenty-eight head of stock were treated with tartar emetic. Of these eleven died. The bull infected by T. congolense was slaughtered. It is almost certain that mechanical transmission is the commonest source of infection on the Stock Farm, and probably all the fourteen two-years-old suspects were thus infected. Isolation of all suspects is being resorted to in order to reduce the incidence by mechanical means.

BLOOD MEAL FEEDING TRIALS

42. An anaemia of Stock Farm calves was first noted by the Veterinary Pathologist in 1942, and was thought by him to be associated with scouring. In the course of his investigations during 1943, the Veterinary Research Officer discovered that the condition was present in a percentage of apparently healthy and thriving calves, whilst scouring and unthrifty calves had often a normal blood picture. At this time blood meal was being fed experimentally to Shika pigs, and it was suggested that the feeding of dried blood might correct the symptoms of anaemia.

43. Tests in connection with the technique of feeding have shown that blood may be fed to calves of all ages. Young calves have been bucket fed finely powered blood mixed with the milk (10 oz to 3 lb milk). Older calves are given the blood mixed in various dry meal mixtures, and quantities up to a quarter of a pound per head have been fed in this way. All stock receiving dried blood appear to have benefited considerably. So far, only one controlled experiment to test the value of blood meal has been carried out, but results are sufficiently striking to be worth recording in detail.

44. Two pens each of seven unthrifty calves were made up, ranging in age from forty-four to seventy-seven weeks. Routine management for both pens was to feed a morning dry ration at the rate of three pounds per head of a ground mixture, consisting of two parts guinea corn to one part green gram seed. Soaked cotton seed was fed *ad lib* to all in the evening. Fodders were also fed in the pens, guinea corn leaves *ad lib*, and occasionally good soya bean hay. During the day, from 9 a.m. to 4 p.m., the calves were grazed over upland herbage, sometimes through guinea corn stover on the arable farm, but mainly over the desiccated grassland which, at the time of the trial, had little succulent dry season regrowth.

Pen No. 1, for a period of five weeks, was fed and exercised according to the routine described above.

Pen No. 2, for a similar period was fed one-quarter of a pound per head per day of blood meal mixed in the morning ration of gram and corn, in addition to routine feeding.

At the end of five weeks the treatments were reversed and Pen 1 were fed $\frac{1}{4}$ lb blood meal per head per day whilst Pen 11 were given no blood supplement. The following table summarises results of this test, in terms of weight increases, for the two experimental periods.

BLOOD FEEDING EXPERIMENT

1st Period. *Supplement Fed*	*No. calves Pen*	*Average age at start*	*Length of period*	*Av. wt. at start*	*Av. wt. at finish*	*Av. inc.*	*Av. inc. per day*
		days	days	lb	lb	lb	lb
1. No Blood ..	7	472	35	189.1	202.4	13.13	0.38
1. 4 oz P.H. per day	7	518	15	190.1	231.9	41.8	1.17
2nd Period.							
1. 4 oz Blood ..	7	—	21	202.4	238.4	36	1.17
1. No Blood ..	7	—	21	231.9	255.2	23.3	1.11

45. In the first period, the average increase in weight of the calves receiving blood meal was 208 per cent over that of the calves not receiving blood meal. In the second period, when the treatments were reversed, the percentage superiority of blood meal pen, whilst still significant, fell to 54 per cent. This reduced figure would appear to be due to the continued beneficial effects of the dried blood fed during the first five weeks period. Net average live weight gains, due to the feeding of blood, for the two experimental periods, amounted to 41.2 lb per calf for the 14 lb blood meal fed. To reduce this to terms of pounds, shillings and pence gives no adequate reflection of the value of the blood supplement but based on meat prices, the live weight gain per calf due to the feeding of 2s 4d worth of blood meal is valued at 8s 7d.

46. Equally striking results were obtained in non-experimental feeding of dried blood to calves convalescing after scour. Within a very few weeks most of them were again sleek-coated, well filled out, and the picture of health. Blood meal therefore appears to be an extremely useful adjunct to the normal rations, and arrangements for its manufacture have already been made at Kano and Kaduna and Zaria. It is proposed to extend its manufacture to other places where large numbers of cattle are slaughtered.

ILORIN STOCK FARM

47. The full report on the work of the Ilorin Stock Farm has been submitted separately. There was no change in policy during the year. More information as to resistance to trypanosomiasis has been obtained and the inheritance of this resistance has again been closely studied. In addition, the programme of experimental work on the treatment and improvement of pastures was greatly extended. At the end of 1943 the herd had increased to 220 animals, despite the sale of sixteen beasts.

48. As a result of the elimination of non-resistant strains, the selection of suitable bulls, control of fly breeding, and probably also to the lower average age of the animals, the incidence of trypanosomiasis has been less than half that of 1942. Piroplasmosis on the other hand has been on the increase although only three deaths have been attributed to it. This increase is probably associated with a greater incidence of ticks, as the former regular annual burning of pastures which undoubtedly destroyed ticks has been almost discontinued in recent years.

49. In the Shorthorn herd there were nine deaths of which seven were due to Trypanosomiasis. The history of these animals is of interest. The two adult losses were both sired by Bull G. C. 44 whose own record and that of his progeny were both unsatisfactory as regards resistance to Trypanosomiasis. Their respective dams G. C.

15 and G. C. 13 also had a poor record in this respect. Of the young animals lost through trypanosomiasis one was I. G. C. 138 whose sire died of chronic trypanosomiasis and whose dam had to receive treatment. Another was a bull I. G. C. 119 who was sired by G. C. 24, a bull whose record is excellent, but his dam and her family have an indifferent record. It has now been possible to pick out certain families whose records are outstanding for apparent resistance to trypanosomiasis, namely, animals bred from cows G. C. 6, G. C. 10, G. C. 25, G. C. 46, G. C. 47, G. C. 48 and G. C. 49 and from bull No. G. C. 24.

50. The N'dama herd continues to show great promise in every respect and with new methods of management there has been a marked reduction in the number of days between calves namely from 515 days to 433. There is already evidence that this figure will be still further reduced. The abnormally long interval between calving and the first subsequent heat is still the main cause of the trouble. This figure varies with individual cows from ninety days to over 200 days. The only losses in the herd were of two young calves. There were no losses from trypanosomiasis. While none of the trypanosome-resistant breeds seems comparable to the best Zebus as regards milk yield, the N'dama seem to be the best of them in this respect and one or two cows have given very satisfactory yields. The butter-fat content of the milk compares very favourably with that of Zebu cows.

51. It seems obvious that the N'dama breed is destined to play an important part in the development of Animal husbandry throughout very large areas of Nigeria, and on our own farms we have now decided to grade up to N'damas the local Nigerian Shorthorn (dwarf) cattle and the various Zebu crosses which constitute the Borgawa type and the Gambia type. As all this work cannot be done at Ilorin, the herds have been divided between Ilorin, Oyo and Moor Plantation as follows :—

Pure bred herd of N'damas at Ilorin
Pure bred herd of Gold Coast Shorthorns at Ilorin
Grade herd Borgawa, etc., X N'dama at Ilorin
Grade herd Borgawa, etc., X N'dama at Oyo
Pure bred herd of Nigerian Shorthorns at Ibadan
Grade herd of Nigerian Shorthorns X N'dama at Ibadan

This is a logical division, as the types with N'dama and Zebu blood are likely to be required for the Middle belt and further north, while those with N'dama—Shorthorn blood will be required for the Southern Provinces.

52. The animals kept at the six Stock Testing Centres which were established at scattered points where conditions differ from those at Ilorin maintained their health well. Three of these Centres have now served their purpose and the cattle have been withdrawn and the land put down to grass. Shorthorn bulls of the Gold Coast strain from the Stock farm which have been running with Nigerian Shorthorn and Borgawa herds under ordinary native conditions at several places in the Ilorin Province are well cared for and in good condition and very satisfactory calves are being produced. Eight bulls have also been distributed to village herds in the Kabba Province. At Kabba calves by the bull so supplied were found to be nearly twice as heavy as the pure Nigerian Shorthorn calves of the same age.

DEPARTMENTAL DAIRIES

53. The Samaru multiplication herd and the Shika Stock Farm supplied the cows for the two Southern Provinces Dairies at Lagos and Ibadan. During the year forty-nine cows were railed to Lagos and six to Moor Plantation. At the end of December the

multiplication herd amounted to 116 head. 12,911 gallons of milk were supplied from the Lagos Dairy, distribution being undertaken by Messrs John Holt and Co., Ltd. This compares with 12,545 gallons in the previous year. The Kano Native Administration Dairy produced 50,183 lb of butter compared with 60,072 lb in 1942. The decrease was mainly due to the severe Harmattan and prolonged dry season, with consequent loss in condition in herds. There was also a large decrease in the amount of pasteurised milk sold by Messrs London and Kano Ltd., Kano, as all supplies were required for butter making. The Zaria Dairy showed slight decreases, total sales being 30,217 bottles of milk, 4,641 jars of cream and 531 bottles of clarified butter fat as compared with 32,720 bottles of milk, 6,005 jars of cream and 663 bottles of clarified butter fat in the previous year. The Moor Plantation Dairy produced 872 gallons of milk, 7 lb of butter and 118 lb of soft cheese. Small private dairies were in operation at Kabba and Okene where 500 lb of butter and 1,678 bottles of milk were produced. At Lagos, a dairy is being started by a private individual and is receiving all possible assistance from the Department. We also purchased 100 cows on behalf of the Gold Coast Government for establishing a dairy at Accra.

CHAD HUMPLESS CATTLE

54. Further investigation has shown that there are two different but related breeds of these humpless cattle. One of these " Kuri " is confined to French Chad but the other " Jotko " is fairly common in the Mobber district of the Bornu Province. The " Jotko " herd mentioned in last year's report is being gradually built up and it obviously has great possibilities as a milking breed. The following table shows the records of all lactations so far completed.

Cow No.	*Lactation Yield lb*	*Yield in lb per day between calves*
F1	3,317	6.7
F2	3,599	7.0
F1	3,953	Not calved again
F5	1,299	do

PIGS

55. In addition to the work on the improvement and management of cattle a large piggery is maintained at Shika, and there are similar piggeries at Minna, Daudawa, Samaru, and Zonkwa, with smaller ones at Bauchi and Maiduguri. At these piggeries we are grading up to the Large White breed. Six boars of this breed were imported from England in 1941 and a further twelve in 1943. At Shika, however, we are maintaining on a small scale a type introduced from Duala. This breed has a marked resemblance to the Essex breed. Crossed with the Large White the progeny make excellent bacon pigs. They are rapid growers and very economical feeders.

56. The total breeding herd now consists of 263 sows and 102 gilts, and at the end of April, 1944, 2,780 pigs were being fattened. In 1943, 1,930 pigs, the dressed carcase weight of which amounted to 260,600 lb, were sent to the cold store for bacon. This compares with 454 pigs with a dressed carcase weight of 61,300 lb in 1942. In the first four months of 1944 the number sent amounted to 1,337 with a carcase weight of 180,000 lb. The speed at which these herds have been built up will be appreciated when it is realised that when pig production was first seriously discussed in 1941, Shika had only four aged sows and seventeen female progeny.

57. A considerable amount of experimental work has had to be done in working out suitable rations from local resources. Rations are now made up of guinea corn, maize, groundnut meal, and palm kernel meal. As in the case of calves, striking results have been obtained by the feeding of blood meal. At Shika three feeding trials were completed during the year and a fourth is in progress. The main trial, which was carried out on twenty-one piglets and which lasted fourteen weeks, resulted in a percentage gain of 117 per cent in weight increase as a result of the feeding (supplementary to the standard rations) of one ounce of blood per head per day. There was no further significant increase when double this amount of blood was fed. The average time for fattening pigs to bacon size (180 lb) was thus reduced from 43.7 to twenty-eight weeks, although no blood was fed until the start of the experiment, when the pigs were approximately 100 days old. Expressed as weight, 6 lb 2 oz of dried blood per pig, gave an average net increase of 66½ lb live weight. At 8d per lb live weight, this represents a cash value of over £800 per ton blood meal.

58. A large privately owned piggery was recently started at Kano, the initial stock being supplied from the Zonkwa piggery. This piggery which now has a herd of 250 pigs is equipped with up to date buildings and is run on sound lines. Well-bred boars have also been sold to a few sound African piggeries. Every effort is being made to encourage African piggeries. At both Anchau and Bauchi a scheme for the purchase of weaners produced by peasant farmers is in operation and during 1943 over 300 weaners (two months old) were received at Samaru for fattening from Anchau.

59. At Moor Plantation experimental work is in progress in connection with pig keeping in the Southern Provinces. The programme includes investigations into the most suitable types of housing, feeding, etc. Excellent results are being obtained at present with pigs which are ¾ imported blood and ¼ native blood. Biting flies constitute one of the main problems with all livestock work in the Southern Provinces, an estimated total of 250,000 flies were trapped in twelve pig pens on Moor Plantation. During the year of which about ⅓ were Stomoxys (spp.).

POULTRY

Selection and Improvement of Local Types

60. Our survey of local poultry types has now revealed a range of annual egg production from sixteen up to 111 eggs. The higher figures are well above the average for Rhode Island Reds under the same conditions, though the local eggs are naturally smaller. Some of the Nigerian hens have not gone broody at all during the ten months in which they have been accurately recorded for broodiness. Others, even though treated in the normal way for broodiness, have averaged four days a month broody. Of the Nigerian cocks which were progeny tested in 1942-43, one has proved outstanding as regards fertility, hatchability and the rearability of his progeny, while his daughters averaged 31.4 eggs in their first six months in lay and 77.8 in their first year. These desirable characters were concentrated by mating him back to his daughters. Six of his sons by these matings are being progeny tested with related and unrelated hens.

61. The difficulties of importing fresh Rhode Island Red blood annually have necessitated a change of breeding method. Five Rhode Island Red lines have been established and are being multiplied up by line-breeding. The flock is gradually recovering from its decimation by Fowl Cholera and other diseases in 1942-43. There were no outbreaks of disease during 1943-44. Distribution of Rhode Island Reds and Crossbred Stock from Moor Plantation during the year was as follows :—

Hatching Eggs	762	Chicks	116
Pullets	97	Cockerels	101
Hens	19	Cocks	27

62. A third importation of Australorp eggs was made during the year, and eggs and chickens distributed to interested poultry keepers. There is a considerable demand for these birds but no propaganda is being done as they have not yet had tine to prove that they are fully suited to Nigerian conditions.

FODDERS AND PASTURE

63. Research in connection with fodder and pasture problems has been in progress for some years but with the rapid expansion of livestock-farming by the Department this work has been developed on much greater scale. By the end of 1943 there were forty-eight different varieties of grasses under test. Besides selections of indigenous grasses, there are introductions from different parts of the American continent and from South and East Africa. Molasses grass (Melinis minutiflora) has been an extremely useful general purpose grass for wet and dry season and East African Star grass shows promise. Elephant grass and canes introduced from Trinidad supply by far the largest bulk for byre feeding. Sunflowers grown over a period of three months gave a good bulk of fodder.

64. Investigation of upland pasture problems and questions of extensive and intensive improvement are being studied at Bamenda, Shika and Ilorin. The work entails pasture surveys, demarcation of different types of pasturage and management to secure maximum carrying capacity. Work is as yet on a small scale. Although satisfactory progress is being made, the scope is limited by lack of staff. Adequate study of this comprehensive subject will probably involve the setting up special stations engaged on this work alone.

65. Our experiments with temporary leys of Kyasua (Pennisetum pedicellatum), laid down at both Maigana and Gusau, are now giving interesting results. At both places yields of hay have steadily increased up to the 4th year but at Maigana there was a very marked drop in yield in the 5th year and the proportion of Kyasua fell from 80 per cent in 1942 to 23 per cent in 1943. It still remains to be seen what effect, if any, these temporary leys have had on soil fertility. At Samaru excellent hay was made from Soya beans but the yields of hay were much lower than from Mucuna which still remains the best fodder legume for this area.

GOATS AND SHEEP

66. In all our work with goats, disease has hitherto been the limiting factor but experimental work has been continued at several stations and progress is being made both with the difficult problem of fitting the goat into a system of mixed farming and with investigations into the possibility of making more use of goats as milk producers.

67. At Bauchi a small herd of goats has been successfully kept in a permanent enclosure for five years. They are breeding normally and are now practically free from disease. This system is now being tried on a unit farm, the enclosure being gradually moved across the farm. At Sokoto and Kano we have not been so successful in controlling the movements of goats, and those on free range are definitely in better condition than those confined to enclosures. There seems little doubt that the leaves of certain bush shrubs are essential for the well-being of the animals when they are kept under confined conditions.

68. At Daura two flocks of goats have been maintained and have been recorded for milk yield since 1941. The average yield of milk on the goat unit farm works out at 70.26 lb in 117 days but some of the better milkers can do much better than this. One

nanny produced 159 lb in 167 days or .95 lb per day during the period of lactation, and another gave 129 lb in 150 days. It is of interest to compare these figures with yields obtained at Onitsha, where the best yield was 160 lb in 119 days or 1.34 lb per day in milk. Another gave an average of 1.2 lb per day in milk for 194 days and a total of 233 lb.

69. An attempt to maintain a large flock of sheep at Daudawa for the army was frustrated by a serious outbreak of blue tongue disease, but sheep are now being successfully kept on some of the unit farms at Moor Plantation.

BAMENDA FARM

70. The 700 acre farm which was started at Bamenda in 1940 is being steadily developed and a dairy herd is being built up. The cows are being purchased locally, but the bulls have been sent from the Shika Stock Farm. Of the twenty foundation cows originally purchased, 35 per cent were found to be suffering from tuberculosis. A considerable area of the farm is being devoted to grazing and pasture improvement experiments. Careful records of grazing have been kept. On the cultivated area, among the crops being tested are wheat, soya beans, linseed, pryrethrum and potatoes. Linseed produced a yield of 227 lb seed per acre. Wheat has so far not been a success and more experiments are required to ascertain the best method and time of planting. The production of Arabic Coffee is being encouraged.

MAINTENANCE OF SOIL FERTILITY

71. A determined attack was made on the problem of the acid eastern soils. This was initiated by a prolonged tour of the Eastern Provinces by the Agricultural Chemist He studied the results of previous experimental work at the various stations and discussed problems and future work with the local Agricultural Officers. At the same time numerous soil samples were taken for subsequent laboratory examination, mainly with the idea of working on available potassium content, a factor which preliminary field work has indicated as likely to be very important.

72. In reviewing the position reached in our work on soil fertility, the Agricultural Chemist has emphasised the importance of the fundamental differences between the main soil types. He suggests that the soils of the " Ilepa " group, represented at Moor Plantation, contain exceptional reserves of fertility, either in the form of incompletely weathered minerals in the soil itself, or in that of decomposing rock at the depth reached by plant roots. This idea affords an explanation of the remarkable results of our experiments with green manures on Moor Plantation, in which yields are still being maintained after more than twenty years of continuous cropping. Similar green-manuring experiments on the relatively good sedimentary soil at Nkwele (Onitsha) at first appeared to indicate that the fertility of some of the best areas (of a clayey texture) was being maintained, but now, after ten years, there is no doubt that a steady fall in yields has been occurring.

73. It is well-known that the typical " Acid Sands " group of soils of Benin and the Eastern Provinces rapidly loses fertility under continuous cultivation. The Agricultural Chemist describes these soils as having been derived from very porous sedimentary beds, which have been subjected to intense and prolonged leaching. In nature, a high-forest cover developed, resulting in the accumulation of relatively large amounts of plant-food at the surface in a closed cycle of growth, decay, and re-absorption ; therefore, when first cleared, these soils are highly fertile, but they contain no reserves to replace

the losses which inevitably occur if intensive farming is attempted. In fact, where the pressure of population is great, degradation of the " acid Sands " has reached a very serious stage.

ARTIFICIAL MANURES.

74. The differences between soil types are clearly demonstrated by the results of the artificial-manuring experiments to which reference was made in a previous report. These experiments, involving annual applications of nitrogen, phosphate and potassium, alone and in all combinations, had to be temporarily discontinued after 1940, but the results then obtained can be summarised as follows. The area used at Moor Plantation did not prove markedly deficient in any of the main plant foods, though superphosphate consistently produced small increases in maize yields. Results at Benin at first showed good responses to all manures, but applications were omitted in the second year, causing very poor yields subsequently. At Nkwele the experiment gave very clear results; each manure produced a big increase in yields, whilst the effects of the combinations were even greater than the separate effects added together. At Umuahia the results of the experiment, which also included a farmyard manure treatment, were less clear than in the case of Nkwele, but the main feature was a great response to the combination of artificials on the limed area, whereas only the farmyard manure showed signs of maintaining yields on the poor unlimed area. The following figures illustrate these results :—

Umuahia	1939 *Yams* (*lb per acre, nett*)		1940 *Early maize* (*lb per acre, dry grain*)	
	Limed	*Unlimed*	*Limed*	*Unlimed*
No manure	5,398	3,030	858	87
F.Y.M.	7,126	6,174	1,376	735
NPK	8,842	5,214	1,716	242

Nkwele	1938 *Yams* (*lb per acre, nett*)		1939 *Early maize** (*lb per acre, unhusked cobs*)		1940 *Yams* (*lb per acre, nett*)	
	Limed	*Unlimed*	*Limed*	*Unlimed*	*Limed*	*Unlimed*
No manure ..	6,227	4,973	1,324	1,028	4,564	3,854
NPK	11,029	10,125	4,775	4,357	6,750	6,839

* Yields recorded as unhusked cobs, owing to irregular weaver-bird damage.

LIME

75. The quality of local lime deposits has been investigated by the Chemist from time to time. A limited amount of burnt lime was secured from Igumale and from another deposit on the Abakaliki road, and was used for experimental work at Umuahia. A good deposit was found by the Agricultural Chemist in Awgu Division at a point about eight miles from the railway. A simple kiln was built, and coal was imported by rail from Enugu. All Departmental requirements for experimental work can now be supplied from this source. In addition to being suitable for Agricultural purposes it is suitable as a whitewash. It is non-hydraulic and therefore not suitable for lime mortar work by itself. The Public Works Department are testing it mixed with some cement for mortar blocks. The intention is to hand over the lime burning unit to the Native Administration as a going concern, when sufficient outlets have been found for the lime

to make it an economic proposition. The technique of manufacture is extremely cheap and if the use of lime becomes extensive among farmers, they can be supplied with good lime at a low cost.

CACAO SOILS

76. A detailed study of the soils in the neighbourhood of the Ibadan Native Administration Experimental Cacao Farm, fifteen miles south of Ibadan, has been in progress since the end of 1940. The main conclusion reached is that the growth of cacao in the Crystalline-Rock area is not limited by soil fertility but by the moisture content of the soil which is largely determined by the mechanical composition (*i.e.*, the relative proportions of sand, silt, and clay). The great variations in mechanical composition which occur in this area have been shown to be caused partly by differences in the complex parent rocks, and partly by a "sorting-out" effect related to the natural processes of development of the topography.

77. A small chemical laboratory has been started at the Oil Palm Research Station. An assistant is to be posted to this laboratory and it is proposed to investigate the seasonal variations in soil nitrate content in acid soils. Similar work on the more fertile soils of Moor Plantation gave illuminating results some years ago. Work on the oil content of palm fruit will also be carried on at this laboratory in collaboration with the Botanist.

OIL PALM INDUSTRY

Palm Planting

78. Palm planting has slowed down, as Departmental Officers were so fully occupied on work connected with immediate essential production. Nurseries of selected material are, however, being maintained on a reduced cale. A total of 45,290 palm seedlings were distributed, the bulk of these being taken by farmers in Owerri, Benin and Warri Provinces. This number of seedlings at the normal rate of planting is sufficient for over 700 acres. The acreage planted under Departmental supervision was 386 acres, and the number of planters was 209. In 1942, 829 acres were planted in a similar way by 426 planters. One of our main concerns at present is the serious fall in yield and the frequent occurrence of yellowing disease in plantation palms after about the 9th year. This phenomenon is illustrated by the following figures from Benin and Umuahia.

	Umuahia Block UR 1-462	Benin Block- BE 1-429
Year	*Wt. of Bunches (lb)*	*Wt. of Bunches (lb)*
1933	160	248
1934	1,752	1,425
1935	3,068	3,021
1936	4,531	5,029
1937	6,288	5,460
1938	5,808	5,410
1939	5,951	6,178
1940	4,714	5,043
1941	4,393	5,496
1942	4,012	3,200

Experimental work is being concentrated on these problems. So far as yellowing disease is concerned, heavy applications of ash have given very striking results on severely yellowed palms at Onitsha, and more economic rates of application are now being tested

in a new experiment. Other work is concerned with possible cultural means of preventing or minimising loss of soil fertility under planted palms.

FREE FATTY ACID IN PALM OIL

79. The F.F.A. content of palm oil has been the subject of much discussion and enquiry in connection with the fixing of new grades and in connection with deterioration of the oil in this respect during storage or transport. For many years the price of palm oil on the United Kingdom market has been subject to a price differential of 1s 9d per ton per unit percentage of F.F.A. over the whole range, and this has determined the differences between buying prices for the several local grades. Under the new grading scheme the price differences correspond to a differential of 3s 4d per unit up to 18 per cent F.F.A., and 1s 8d per unit for oil with over 18 per cent, thus encouraging the production of the better grades. In view of the often repeated criticism of the quality of Nigerian palm oil, it is interesting to note that the grading figures for the period 20th January, 1944 to 25th May, 1944 showed that 49.64 per cent of the palm oil purchased for export was below 9 per cent F.F.A. The full figures are as follows :—

	F.F.A. %	Tons	Percentages
Grade I ..	0.9	32,441	49.64
Grade II ..	18	16,927	25.91
Grade III ..	27	8,803	10.27
Grade IV ..	36	6,716	13.47
Grade V ..	36	462	.71

80. A drum or cask of oil usually shows an increase in F.F.A. per cent between original purchase and delivery at the Bulk Oil Plant, this increase is known in the trade as a " set-up ". It is a common belief that a main cause of rapid increases in F.F.A. is the mixing of oil of different grades by the middlemen (who naturally aim at bulking the smaller quantities which they buy in such a way as to bring the F.F.A. per cent of each drum close to the upper limit of a grade.) Our investigations have not entirely supported this view. The rate of increase is known to be very variable, but it appears that the very rapid increases which have been claimed to occur in some quarters have been exaggerations, partly due to incomplete mixing and incorrect testing and recording. The Chemist has pointed out that the formation of free fatty acid depends on chemical combination between oil and moisture, and has demonstrated that the rate of increase of F.F.A. is largely determined by the amount of moisture present. Driving off moisture by heating, effectively prevents any increase, and this procedure is often the final step in native methods of extraction. It has, however, the serious disadvantage that the red pigment of the oil is very liable to be partially destroyed, and the dark-coloured substances produced are said to be difficult to bleach during refining or soap-making processes.

OIL PALM MACHINERY

81. The adaptation of a suitable hand-operated palm press has been continuously investigated since 1924. Early efforts consisted in demonstrating the possibilities of different kinds of presses in the main oil-producing districts. For a number of years response was disappointing and actually disheartening, but gradually headway was made in important oil areas of the Eastern Provinces. Of recent years the extent to which presses havebeen adopted in some of the main oil-producing districts has been spectacular, especially in areas producing low quality oil. During the year, fifty-seven

of the United Africa Company gift presses have been distributed and there is still a waiting list of 150 applicants. A repair service for broken presses has been organised by the Agricultural Officer, Umuahia.

82. Although the possibilities of hand-operated palm nutcrackers have been investigated over the same period as those of palm oil presses, progress has been relatively small. In the Nun River district of the Niger Delta, however, crackers have been in general use for many years. Stationary power-driven Nutcrackers are limited in their use as it is difficult to place them where there is a sufficient supply of nuts to keep them in constant operation. Mobile power-driven nutcrackers have been ordered but have not yet come forward. As with presses, it has been necessary to organise a repair service. One of the main disadvantages of the nut-cracker is that the output of cracked nuts is far in excess of the capacity of the people to separate the kernels from the broken shell. All previous attempts to evolve a simple system of separation have failed to find a solution which would have been popular. Further experiments on this problem have recently been carried out at Umuahia and a machine made from local materials has been devised. This, however, is still being tested.

OIL PALM RESEARCH STATION

83. The function of the Oil Palm Research Station is to conduct research for the improvement of the Oil Palm industry in West Africa. The main lines of research at present are :—

(*i*) Experiments on Breeding and selection for improved seed, and other concomitant investigations.
(*ii*) Experiments to determine the most efficient methods of cultivating oil palms.
(*iii*) Experiments on methods for the improvement of extraction and processing.

There is also an urgent need for large scale experiments with artificials and farm yard manure, which will be started as soon as artificial manures are available.

84. In addition to the work at the main station, important subsidiary work was carried out on many other Agricultural Stations. The United Africa Company Oil Palm Estates were visited and there was the usual help and exchange of information. A solid foundation is being built up on which to base a considerable expansion of research for the future when staff becomes available.

85. A large planting programme was carried out in 1943 ; a total of 197 acres comprising 11,811 palms being planted. Much of the planting was in the form of randomised statistical experiments and the work involved was enormous. The following gives an idea of the rate of planting :—

AREAS PLANTED AT O.P.R.S. (IN ACRES)

	1939	1940	1941	1942	1943
Progeny trials (Breeding Programme).	39	41	142	9	63
Cultural Experiments ..	—	24	2	—	120
Tests of Extension Work Seed.	—	—	6	—	14
Totals	39	65	150	9	197

This makes a total of 460 acres planted. A further 300 acres were used for war production. A 100 acre natural palm grove has been mapped and is being recorded for yield. About 1,000 acres—*viz.*, about a quarter of the total area of the station, are being utilised in one form or another. About thirty cattle and about twenty sheep are kept primarily for producing manure for experimental purposes.

86. An important spacing experiment was laid out to determine not only the optimum spacing for palms grown as a sole crop, but also the most economic form of spacing for farmers who may wish to plant food crops or graze cattle between their palms. The experiment has a complicated statistical design which is based on advice from experts in England. It is probably the largest single experiment ever undertaken by the Agricultural Department.

87. Considerable anxiety was caused by the appearance in the nursery of a root disease, which caused the loss of nearly 50 per cent of the seedlings. This occurrence naturally had disastrous consequences for the 1944 planting programme. Energetic measures were taken by watering and shading, in an effort to save as many seedlings as possible. In order to find a more practicable control measure for the future, an extensive programme of experimental work is being undertaken.

88. Two types of improved seed for distribution to farmers are being produced, namely Hard × Hard and Hard × Soft, the parent trees having been carefully selected for high yield and good fruit composition. During 1943, enough seed of each type was produced to plant 1,500 acres. Production of a third type, produced by crossing thick-shelled (Hard) parent trees with pollen from " sterile " trees, was also commenced. It is held in the Belgian Congo that this type of cross gives nothing but thin-shelled (Soft) trees, and this cross is therefore likely to be of considerable interest to farmers whose main concern is the production of Palm Oil as distinct from Kernels.

89. The work of palm oil research has devolved almost entirely on one Botanist who has acted in the onerous dual capacity of research worker and plantation manager. It has been a strenuous undertaking, and it is quite beyond the capacity of one man to continue the work for more than a short period. The matter of further staff and permanent houses for both Europeans and Africans is urgent and essential if the progress of this important line of research is not to suffer a serious set-back.

PALM KERNEL BORER

90. The South American Bruchid beetle, *Pachymerus* lacerdae, Chev., was found attacking stored Oil Palm nuts at O.P.R.S., Benin. Investigations at Ogba Farm, Benin, have shown that the pest is present there in both stored nuts and in fallen nuts under the trees. The larvae enter the nuts through the micropyles and the larval and pupal stages are passed inside the kernel ; the adult beetle bores a circular hole about 0.2'' in diameter through the shell of the nut. Investigations are being made to determine if the presence of the beetle is widespread. It seems probable that it has been in this country for a number of years. Infestation in stored nuts was not heavy, and it is probable that palm fruits on the tree are not subject to attack unless the mesocarp is damaged.

PLANT BREEDING

Cotton Selection—Southern Provinces

91. Doubts having been expressed about the continued self-pollination of our Ishan cotton which has been going on since 1924, two bulk strains were tested for yield, half of each arising from self-pollination, the rest from open pollination. On the average,

self-pollination did not appear to depress yields, but in the poorer family the self-pollinated strain was significantly lower in yield. The better self-pollinated strain will be used for planting next season. Both self and open pollinated seed from sixteen plants of this strain have been harvested. The strains of cotton selected for rough lint have proved inferior to Ishan A in yield, and either worse or no better in roughness of lint and hairiness of leaf. These have been abandoned.

COTTON SELECTION—NORTHERN PROVINCES

92. Selected strains D5, D8 and D30 and their derivatives continue to be maintained by self-pollination. They are also being multiplied for distribution. Our cotton selection work has assumed a much more encouraging aspect with the production of the strain 26C (a derivative of D5). It yielded 60 per cent more than the standard B.C.G.A. Allen ex Zaria ginnery in 1939, and 100 per cent in 1942-43. It has since had favourable reports from brokers and spinners, being, if anything, slightly stronger than ordinary Allen. Two miniature bales, one of 26C and the other of standard Allen, grown under similar conditions, were despatched to the Shirley Institute for spinning tests in August, 1943. Referring to the results of these tests, the Secretary, Empire Cotton Growing Corporation wrote as follows :—

> " You will note that the hair characters of the two samples were practically the same and that the two samples show no appreciable difference in the spinning tests. Seeing that the yield of lint per acre of 26C is apparently double that of British Cotton Growing Association I should think that you would be very pleased with these results."

There is no doubt whatever that 26C is the most promising strain which the Senior Botanist has so far been able to produce and he is to be congratulated on a result which has taken many years of patient work and many disappointments. It will now be multiplied for general distribution as rapidly as possible. 56,700 lb of seed of D5, D8 and D30, multiplied on 410 acres at Daudawa in 1942, were issued to Awai farmers for planting in 1943. In 1943, 500 lb seed of D5, D8 and D30 mixture was issued to Daudawa for their stage I multiplication.

FOOD CROPS—SOUTHERN PROVINCES

93. Work has been continued on the more important food crops. Varieties of cassava, resistant to mosaic disease, are now being distributed for trial at other stations ; 150 varieties are now under observation, and fresh pollinations are being made. The Botanists report that they can now graft cassava successfully : this will be useful in further research on virus infection. An inter-specific graft with Ceara may be of some interest. The varieties in the collection of yams are being multiplied for a yield trial. Some of the strains produced from seed in 1939 and propagated vegetatively since then again gave greater yields than their parents. The results of the trial of cowpeas resistant to root knot disease reported last year, were confirmed this season, despite poor rainfall. Of three introductions from South Africa, " New Era " fruited well only two months after sowing ; seed has also been introduced from East Africa for trial in 1944. The Trinidad Soya bean again proved the best. A spacing trial showed that, by branching freely, the plant can compensate for difference in spacing up to two feet apart on 4′ ridges. We have not yet found a reliable method of seed storage.

PERMANENT CROPS—SOUTHERN PROVINCES

94. The results from the trials of Nigerian Cocoa selections in 1943 were in accordance with those of the previous year, in that they indicate that the size of the bean is an inherited character. Controlled pollinations are being made during 1944 to provide

seedlings for planting a new trial in 1945. In this trial the progenies of local selections, including the new second generation, and those of cocoa introduced from Trinidad will be compared. Work on vegetative propagation was continued, and nearly 70 per cent of buddings were successful : cuttings of T. 38 set during the latter half of 1942 were planted out in 1943 and are now flowering.

95. The isolated plots of white-seeded Kola are now bearing and for the most part white nuts are being produced. The few red or pink nuts produced may have been due to pollination from some wild kola trees in the forest, or possibly to errors at the original pollinations as most trees bore only white nuts. An interesting experiment with the budding of coffee is now in progress. Scions from Arabica coffee have been budded (and a few grafted) on to Liberica and Robusta stocks. The object is to ascertain whether Arabica coffee on stronger stocks can thrive here, where the low altitude is normally unsuitable for it. Budding of local Mango stocks continued with four good introduced varieties as scions. Budwood has been sent to other stations sufficient to provide about 1,000 buds. The aim is to have each variety represented at every station so that budding can be done for local distribution.

ANNUAL CROPS, NORTHERN PROVINCES

96. Sixty-eight selections of groundnuts from the local Zaria Upright variety are being maintained at Samaru, and sixteen selections from Zaria Upright and four K. 38 (Ceylon) selections are being maintained at Kano. Castle Cary and S. 38 (Zaria Upright selections) are being multiplied for distribution at Samaru and K. 38 for distribution at Kano. Ten unselected introduced varieties were also maintained. Work on Soya beans consisted of the multiplication of the three varieties Benares, Trinidad, and Malaya which have already proved to be satisfactory, and observation plots of twenty-three introduced varieties. None of these appeared to be outstanding. Isolation plots of several varieties of pigeon peas were also maintained.

DAUDAWA FARM

97. The multiplication of cotton seed continues to be the primary object of Daudawa, and the Nigerian Government continues to receive a grant of £1,600 per annum from the Empire Cotton Growing Corporation for its upkeep. The yield of seed cotton in 1943-44 was the highest ever recorded on the home farm, averaging 402 lb seed cotton per acre over 130 acres.

98. 750 acres of the estate are now farmed by forty-nine small holder settlers who had 350 acres under cotton. Their yields were, however, disappointing, averaging only 189 lb seed cotton per acre. It was a short cotton season without any late rain in October and the settlers were late with their planting. This settlement scheme has been an unqualified success, and may well serve as a model for soldier settlement schemes. Eight new units were added in 1943 and a further twelve are being prepared for 1944. Of the forty-nine settlers, only three have yet failed to pay off their advance in full. The remainder have credits, according to their accounts, of over £350, in addition to which they own some 200 cattle. As most of these men were poverty-stricken farmers or casual labourers a few years ago, this is a clear proof that the system of mixed farming practiced at Daudawa is a sound economic proposition for peasant farming. With adequate funds and staff, this scheme is capable of almost unlimited expansion.

99. The Daudawa estate has acted as a depot for the purchase and supply of Army cattle, and up to the 31st January, 1943, 7,200 cattle had been purchased and 3,500 railed, the remainder being held as a reserve. Daudawa also has a piggery containing

over 400 pigs. A programme of experimental work in connection with swamp farming has also been carried out at Daudawa and has shown that the returns are much greater than from upland farming. Two acres of swamp rice produced a yield of 3,900 lb of paddy per acre, and potatoes have also proved to be a very pofitable crop.

PLANTATION RUBBER

100. During the year an Officer with plantation experience made a survey of African-owned Hevea Plantation, and, with the helpful co-operation of U.A.C. Rubber Plantations at Sapele, he trained a staff of Africans in rubber processing. This staff has since been employed throughout the rubber areas to give instruction to African Planters and raise the standard of processing which had in the past been of very variable quality. The result of this organisation has been excellent, and when the inspection and grading of rubber was introduced in October, 1943, a considerable proportion of African-produced rubber was of high quality. Improvement continues and recent out-turns show that the African plantation owner can produce rubber which compares well with that produced by European Plantations. It is reasonable to hope that the improvements recently effected in the quality of African plantation rubber will enable the industry to compete on favourable terms in the post-war markets.

101. The production of plantation rubber continues to increase. The figures for 1943 show an increase over that of 1942, and the figures for the first quarter of 1944 suggest that there will be a still further increase in 1944. The export figures, as shown in the trade returns, were 4,894 tons for 1942, and 5,000 tons for 1943. The Produce Inspection figures for the first four months of 1944 show the total amount graded as 2,350 tons.

102. A Mission with a wide experience of the Rubber Industry visited Nigeria in 1943 and toured the rubber producing areas. They gave much valuable advice. Together with the Chief Inspector of Produce they formulated rubber-grading regulations which were acceptable to United Kingdom requirements. The grading is applied to both plantation and wild rubber.

103. Some good budwood has been imported from the Cameroons Plantations which was obtained from trees derived from material imported from Malaya. An attempt is also being made to secure some good budwood from Liberia. While the facilities in war-time for securing budwood from good yielding strains is limited, every effort will be made to get as much as is available.

CINCHONA

104. Early in 1943, as a result of discussions with the Director of Medical Services, the Department undertook to make a serious attempt to establish a cinchona plantation on a fairly large scale with the object of producing quinine locally. This is an important project, as the local production of adequate supplies of cheap quinine will have far reaching effects on the health of the people. Every effort is therefore being made to push it forward as rapidly as possible and progress to date has exceeded all expectations. A site for the plantation which gave a range of altitude from about 2,000 to 6,000 feet was chosen at Esosong on the mountain side of Kupe on the Eastern boundary of the Cameroons. Nurseries were established with seed from the small existing plantations, introductions from East Africa, and some seed kindly supplied by M. La Garde, Director of the Quinine Experimental Station at Dschang in French Cameroons. A small plantation has also been started at Bamenda.

105. The programme included an attempt to speed up the production stage by using the Russian method as well as the normal plantation method. Both methods were started simultaneously, but it is likely that the Russian method will, if continued at all, be greatly modified. Four varieties of cinchona, namely, Succirubra, Ledgeriana, Josphina and a Succirubra/Ledgeriana hybrid are being grown. By the end of April, 1944, a total of 1,378,000 seedlings and 44,000 cuttings had been established and transplanted at Esosong while some 30,000 seedlings and cuttings had been similarly established at Bamenda. In the old plot at Bamenda there are twenty-eight trees of Java Ledgeriana which have grown very well. A mixed sample of bark of these trees kindly analysed by M. La Garde gave a quinine sulphate figure of 10.2 per cent. Further analyses of individual trees are to be carried out by the Agricultural Chemist in our own laboratory.

106. I gratefully acknowledge the valuable assistance and co-operation which we have received from the authorities in French Mandated Territory and especially from M. La Garde.

COCOA

107. The production of cocoa was the lowest for nine years. There is no doubt that, as a result of the low prices in recent years, the increasing incidence of sahlbergella and the high costs of labour, the cocoa industry has received a check. New planting has virtually ceased, and attention given to established plantations has been reduced to far below what was essential. The fact that cocoa has been left unharvested has undoubtedly caused damage to the trees and has probably permanently reduced the yield of some of them. The price increases for the 1944 main crop season are therefore greatly welcomed. The situation was carefully reviewed during Dr Tempany's visit and, as a result, a West African Research Station has been set up at Tafo in the Gold Coast to investigate cocoa diseases and pests. Nigeria has undertaken to carry out a survey of the cocoa area, the primary objects of which are a search for the possible presence of swollen shoot and the incidence of capsid bugs.

DATES

108. Six small plantations have now been established in the Bornu Province. The greater part of investigational work is being done at Fika, and here several palms have started flowering when only three years old. This has never previously been recorded locally. It seems certain that there are considerable areas in Bornu where dates are not grown at present but where they could be successfully grown. We still have a good deal to learn about the preparation of the date for the market and investigations are being continued.

THE CITRUS FRUIT INDUSTRY

109. The internal trade in fresh oranges continues to expand steadily as is shown by the following figures for railings from the Eastern Provinces to the North.

	1940	1941	1942	1943	*Recorded Railings in tons*
Eastern Provinces ..	443	1,285	1,647	2,598	—

From Western Provinces some 262 tons of fruit were railed of which 70 tons were oranges. Of the 2,500 tons railed from the Eastern Provinces 540 tons went to the Army. These recorded figures are in addition to unrecorded figures of a vast and growing internal consumption. The sales of fruit drinks by the Blaize Memorial Institute at Abeokuta were twice that of last year, being 213,314 bottles. These fruit drinks are now being sold in all parts of Nigeria. The sales of Jams and Marmalades amounted to 80,595 lb.

110. Citrus nurseries have now been established in most Provinces and the distribution of budded trees from our main experimental farms is on a big scale. Thus 2,000 budded trees were distributed from Yandev during the year and 3,520 from Moor Plantation. The total number of young economic trees of all kinds distributed from Moor Plantation amounted to 9,072.

GROUNDNUTS

111. At both Kano and Daura the programme of experimental work on groundnuts has been carried on in spite of the war. The 1943 results showed very decisively the value of spacing more closely than is normal in native cultivations. There is also some evidence that in areas such as Daura where the growing season is only just long enough, or sometimes not quite long enough, improved strains gradually deteriorate and new seed has to be introduced from areas with a longer growing season if yield is to be maintained. This point however requires further proof.

112. A Lygaeid bug, probably *Aphanus sordidus*, F., has been reported attacking shelled groundnuts stored in bulk at Yola ; damage to nuts in bags appears to be slight. The Agricultural Officer is studying the life history of the bug. He is also investigating the effect of temperature upon it, as the bulked nuts are stored in mud buildings, and it is possible that the higher temperatures experienced in corrugated iron stores might have some effect in controlling it. The Bruchid beetle, *Pachymerus longus*, Pic., was reported attacking unshelled groundnuts in native stores in the Wurkum district of Muri Division (Adamawa) in 1939 ; simple and effective control measures were devised. Recently there have been reports of the presence of *P. longus* in many parts of Adamawa Division and in Southern Bauchi.

BENNISEED

113. In the Benue Province production, though a little higher than last year, was disappointing. The total purchases in the Benue Province for the calendar year excluding November-December were 9 per cent better than 1942, being 8,193 tons compared with 7,494 tons in 1942. Total purchases for the whole country were 9,300 tons. The wet season crop produces the bulk of the benniseed ; but due to the short duration of the rains in April which was followed by a drought, some 40 : 50 per cent of the crop was not planted until early May. The delay in planting probably reduced the yields below normal to the extent of some 30 per cent; Eastern Kabba and Western Kabba between them accounted for 8 per cent of the crop. Yields were poor in these areas.

CASTOR SEED

114. In view of our inability to obtain machinery for the local extraction of castor oil, as explained in last year's report, the prospects for export of the seed to United Kingdom were explored, but as Castor seed can be imported in adequate quantities from elsewhere, there was no real desire to obtain our relatively small supplies. The price offered by the Ministry of Food only gave a price of 1¾d per lb to the producer, and this price could not compete with prices paid for local consumption, nor was it sufficient to stimulate extension of planting ; nevertheless there was an export of some 150 tons during the year of which 54 tons were purchased at Oturkpo. Small consignments of castor oil were supplied to a tannery in Lagos for the processing of leather.

RICE

115. Rice has been grown in the Northern Provinces for many years, although production on a large scale was confined to the Sokoto-Argungu area, the Bida Division and the Ilorin Province. Before the war the only rice producing area of any magnitude

in the Southern Provinces was the Abeokuta Province, production there being almost entirely from upland rice. The whole output was consumed locally or by the Lagos Market. There was, however, an immediate response to the higher prices caused by war conditions, and in both 1941 and 1943 the Supply Officers were able to obtain some 2,000 tons of clean rice for the Army from this area. It is estimated that the total production is now not less than 4,000 tons.

116. Commencing in 1940 a concerted effort was made to popularise the growing of both Inland-swamp and Upland rice throughout the Southern Provinces. The initiation of this drive involved distribution of seed, selection of suitable soils and instruction in all aspects of rice husbandry, and a seed farm was established at Ilushi where trials of several varieties were carried out. Suitable processing equipment was supplied and demonstrated. Success in some cases was immediate, and during the last four years there has been a very big increase in rice growing in many different areas. Progress with upland rice has been particularly satisfactory in the Ondo Province and with swamp rice in the Onitsha Province and the Ilushi Area. It is probable that total production of rice in the Southern Provinces is at a conservative estimate now not less than 15,000 tons.

117. In the Eastern Provinces we are attempting to introduce rice growing in the Cross River Valley between Ogoja and Afikpo, where it is a completely new crop. Demonstration plots varying between 4 to 20 acres were planted at strategic points over the whole area, and the scheme included propaganda and instruction in rice growing and processing. Seedlings were given out at a nominal cost to planters, and farmers were offered subsidies for planting minimum areas in order that they might co-operate to prevent damage by birds. In one instance the scheme was an unqualified success, and over 100 tons of paddy were grown in a small area where rice growing was previously unknown. In other areas success was moderate and in some cases a failure ; nevertheless there are signs that in due course this may become an important centre of production.

118. In the Northern Provinces, from the Bida area alone, the Supply organization was able to purchase 1,650 tons in 1941, 2,100 tons in 1942 and 1,600 tons in 1943, and in 1943, 800 tons were obtained from Sokoto. Seed distribution of both G.E.B. 24 and Guiana Creole 79 have been continued, especially in the Abuja area. Rice growing is steadily being extended among the Southern Zaria pagans and this area is now being used for the multiplication of G.C. 79 seed for distribution in other areas. Every effort has also been made to extend rice production in suitable inland swamps along the Benue, Katsina and Donga rivers. Progress in the Igala Division of the Kabba Province has been very satisfactory and in this area upland rice is also increasing in popularity. Throughout the country much effort was directed towards the distribution of suitable seed, both for planting in new areas and for the replacement of inferior seed where the crop has been previously established.

119. Rice Mills of Planter's Mill type were worked under Departmental supervision at Bida and Ekpoma. Investigation into the most suitable small units for rice processing continues, and also into the reactions of farming communities to small-scale machinery. A planter in Sapele who rented a No. 7 Planter's Mill from the Department has kept it working under high pressure throughout the year. The presence of the rice mill has encouraged extensive planting of rice in its vicinity. The experience gained with these small mills so far points to the conclusion that rice-cleaning machinery as distinct from hulling machines, will have the widest application in Nigeria. In most of the older

established rice areas the people are quite capable of hulling their own paddy but are not so capable of cleaning their crop sufficiently to make it into a good marketable product. We have not yet worked out all the aspects of the application of machinery to the rice industry in Nigeria, and investigations are being continued.

120. The Government of Sierra Leone kindly lent us the services of their Irrigation Engineer to investigate the possibilities of the development of rice irrigation projects, especially in the river valleys. He made a somewhat rapid tour of some of the more promising areas and has written a detailed report. He was most sanguine about the vast possibilities for irrigation projects. The first consideration is to secure a minimum of trained staff to give essential guidance in what is a somewhat specialised line of development.

POTATOES

121. Some idea of the growth of the potato industry may be obtained from the following figures for railings :—

1st April,	1941	to	31st March,	1942	638	tons
,,	,,	1942	,,	,,	,,	1943	825	,,
,,	,,	1943	,,	,,	,,	1944	1,451	,,

The above figures are exclusive of the potatoes consumed in the producing areas and it is probable that total production is now somewhere in the neighbourhood of 1,600 tons.

122. Ninety tons of new seed were imported from the United Kingdom and United States of America in 1943 and was distributed in the Zaria and Plateau Provinces, but it will probably not be necessary to import further supplies of seed in any quantity during the next few years. A scheme for the multiplication and selection of seed was commenced at Samaru Farm, and 14½ tons of seed were issued to local farmers for the dry season planting. Farmers are inclined to place too much reliance on being supplied with seed by the Department, but this is being overcome and they are being urged to keep good seed from their own crops.

123. At Samaru trials for yield, disease resistance and response to various rates of manuring were made with Great Scot and Craig's Defiance newly imported from the United Kingdom, and Irish Cobbler imported from the United States of America. Owing to heavy rains during August the yields were disappointing but Craig's Defiance gave the best results, and a yield of 4 tons per acre were obtained from some plots. This variety was practically free from virus disease, when grown at Shika and Samaru, but when grown at Jos there was a high incidence of internal rot. Great Scot was severely affected with virus and was not true to type. Irish Cobbler was reasonably healthy. It is now unfortunately appears that Great Scot Seed sent out from United Kingdom was not from certified healthy stock. Previous importations of Great Scot have however done well and have remained free from disease. Up to date has been entirely satisfactory. Trials were also made with cut and uncut seed.

124. The possibility of maintaining the supply of potatoes throughout the year by storing under local conditions, is being investigated. The difficulty about the potato crop is that the bulk of the crop is harvested within a very short period. The dry season crop especially presents a difficulty as heavy wastage takes place in April and May. The scope for spreading out the supply by planting at different dates is very limited with the result that there is a glut of potatoes between July and September and scarcity at other times, which is only alleviated by the small dry season crop. During the glut period of 1943 the Department purchased and stored some 84 tons. These

were sold about a month later, the loss being 1.7 per cent by weight. Smaller storage trials carried out last year, but which must be repeated, suggest that potatoes can be stored satisfactorily in baskets, in ordinary native grain stores, and on shelves. But storage in a thin layer on the ground was less satisfactory, while storage in clamps was a complete failure.

TOBACCO

125. The system by which air cured tobacco produced in the Northern Provinces is allowed to mature in barns until the early rains has now been generally adopted and has solved the problem of the severe damage to the leaf caused by handling during the dry season. Very satisfactory leaf is now being produced, from the point of view of both colour and quality. The British American Tobacco are therefore asking for an increased acreage in 1944. The development of the industry in recent years is shown by the following figures :—

Year	*No. of Growers*	*Acreage*	*Total Production*	*Total Value of crop*		
			lb	£	s	d
1939-40	500	110	63,003	696	0	0
1940-41	560	140	55,420	594	0	0
1941-42	752	140	64,684	687	10	0
1942-43	454	121	46,467	836	4	11
1943-44	1,120	280	Buying not yet completed.			

For the 1944-45 season the area planted will be increased to 400 acres. It seems probable that there will, from now onwards, be a steady expansion of tobacco growing in the Maigana area, especially as the improved tobacco grown for the British American Tobacco is now being used for local consumption. Production for the British American Tobacco in the Southern Provinces is being gradually reduced as the quality of tobacco produced is not suitable for cigarettes, but the Lagos Cigar industry is steadily expanding.

GINGER

126. The acreage under ginger in Southern Zaria was probably rather greater than in 1942 but owing to the keen competition of the internal trade for both green and dried ginger there was no incentive to produce cured ginger and purchases of the latter fell to the very low figure of 30 tons. The railings of dried ginger to the Southern Provinces from Kafanchan and Zonkwa alone during the period October, 1943 to March, 1944, amounted to 645 cwt as compared with 619 cwt purchased for export. Although cured ginger was an attractive crop before the war, it is at present at a disadvantage when competing with many other crops which are much simpler to prepare for the market. Most of the crop grown for export now consists of yellow ginger, but although this is much easier to prepare than the white ginger, it was considered desirable to continue the system of washing stations, and the usual analysis were carried out before and after purchase.

SUGAR AND HONEY

127. The demand this year for honey was less than last year as the Army had sufficient stocks in hand from last year's purchases and no alternative market could be found. This year's production from the Zaria area was taken over by the Chief Marketing Officer for local sales. A consignment has been sent to the Blaize Memorial Institute, Abeokuta, to be tried as substitute for sugar in making jam.

128. The total number of sugar crushers in operation during the 1943-44 season was 160, their distribution being as follows: Zaria eighty-six, Kano eighteen, Sokoto twenty-three, Katsina twenty-three, and other provinces ten. A further twenty have been ordered for next season. Total production of sugar is estimated at 1,400 tons as compared with 1,000 tons in the previous season. There is a very keen demand for the sugar from local consumers who are willing to pay 3½d to 8d per lb so that it was only the surplus which was available for the Army. Large quantities were railed from the producing areas to Kano, Kaura Namoda, etc. The Military purchased some 430 tons, but were prepared to purchase more had they been able to do so. Of this, 140 tons came from the Maigana area of the Zaria Province. There is no doubt whatever that sugar-making is a very lucrative industry,—some crusher owners actually make from £50 to £100 profit during the season. The sugar is rapidly finding its own markets and it is probable that when the Army demand—which has been of real assistance in getting the industry going—ceases, the whole production will easily be absorbed by local consumption, and it also seems likely that it will continue to hold its own even when cheap refined imported sugar again floods the market after the war. There appears to be an insatiable demand for cane. Thus, from the Maigana area alone, some 600 tons were exported by rail and a further 600 tons were exported by donkeys. A trial consignment of some 4 tons of brown crystal sugar and over 6 tons of molasses were produced by means of a hand-operated centrifuge. Both products were easily disposed of but costs were too high to enable the sugar to compete with imported sugar. The area under cane in the Northern Provinces has increased considerably in recent years and seems likely to continue to do so.

SOYA BEANS

129. In addition to the variety trials carried out by the plant breeders, the crop was tested at most of our stations. Soya Beans did particularly well at Bamenda where yields of over 300 lb per acre were recorded. Not only are the beans a desirable crop from the point of view of improving the diet of the people, but there is also a potential export market. As an article of diet, soyas are being tested by the Military Authorities and 8 tons were supplied for this purpose from Department farms.

BIRDSEYE CHILLIES

130. The extremely favourable reports on Nigerian Birdseye Chillies received on consignments sent to the United Kingdom, and samples to the United States of America indicate that our product is as good as that formerly supplied from Japan and there seems to be no reason why we should not retain, a share of the market after the war. This is a very satisfactory result of twelve years work on the part of the Plant Breeders. Routine selection was continued in 1943 and four of the crosses between one of the local types and the Japanese type were retained as being promising. Seed was again distributed in the Oyo and Yandev areas, and the crop gave extremely satisfactory returns to the producers. The total exports amounted to 83 tons of which 15 tons went to the United Kingdom, 10 tons to the United States of America and 58 tons to Ceylon.

AGRICULTURAL EDUCATION

School of Agriculture at Moor Plantation

131. The Diploma Course covers four years, the first two years being spent at the Higher College, Yaba, where students are taught the basic sciences, and the last two at Moor Plantation. Although the students are free to take up any post which offers on completion of the course, in practice all have so far been absorbed in the Agricultural

or Education Departments. Five Diploma students completed the course in 1943, four of them successfully. The four successful ones took up appointments as Assistant Agricultural Officers and the fifth is engaged in further study. Four others including two Gold Coast students arrived six months later and continued their studies throughout the year. Seven new diploma students arrived from the Higher College and two from the Gold Coast in 1944.

132. The Agricultural Assistants' Course lasts for three years, six months of which are spent at Agricultural Stations. Recent results indicate that time spent at stations during training is so valuable in developing responsibility that it has been decided to rearrange the course so that the whole of the 2nd year is spent in this way, the students carrying on the normal duties of a qualified Agricultural Assistant under close supervision. A class of eleven students for the Agricultural Assistants' course was recruited in 1942, and a new class of seventeen Assistants was recruited in May, 1943.

School of Agriculture, Samaru

133. The low educational standards of Northern Provinces make it impossible to obtain sufficient recruits of the required standard locally, and boys had to be recruited from schools in the Southern Provinces. Eight Assistants passed out of the school in 1943, and of these six were from the Southern Provinces. The advantage of practical training at Agricultural Stations is equally appreciated at Samaru, and the time spent by students on practical training is to be increased.

Oyo Farm School

134. The School was opened in 1942 with the object of providing a practical training in improved methods of farming for boys who have passed elementary standards of education. The course lasts two years. During their first year the students work on small instructional farms where as comprehensive a training as possible is given in all branches of mixed farming. Special attention is devoted to the maintenance of soil fertility and the care and management of livestock and poultry. During their second year each student works an individual farm, on lines which are as near as possible to the type he proposes to practise when he leaves the school. He is also provided with some of the livestock which he will take away to his own farm when he leaves the school. A new class is selected each year and twelve scholarships are awarded. The scholarship is intended to provide for subsistence during training and capital to enable the student to set up as a farmer when he finishes the course. An area of land is allocated to the farm on which students who have no farm to which they can return may be allowed to settle. The school has been in operation for two years. Of twelve students who have passed out, seven have settled on the School Farm land and the remainder have gone to farm at their own villages.

135. The whole scheme is in the experimental stage and it is premature to make any forecast at this stage as to whether it will be a success, but much valuable information has been obtained both in connection with the recruitment of students and the best methods of training them.

Fisheries

136. As mentioned in previous reports, investigations into some of the problems of the fishing industry were initiated in 1940 with the primary object of ascertaining whether dried fish capable of replacing imported fish could be produced locally, but it soon became quite obvious that with the gear at present available to the African fisherman,

except for an occasional seasonal glut of fish there is no real surplus of fish. In fact the demand for fish is considerably greater than the supply. This was subsequently proved by the actual figures for the weight of fish landed at Apese beach, and by the experience of the Greek firm which started a curing factory at Degema. An attempt by a European at Lagos to increase the supply by means of power-operated craft has made little progress, owing to the difficulty of obtaining a suitable engine for his craft.

137. We therefore turned our attention to the possibility of improving native methods of catching fish, but this work has been largely frustrated owing to the acute shortage of imported machine-made netting and cord on which these industries depend. Nigerian fibres which have so far been tested have proved unsatisfactory as substitutes for the imported types. The Senior Agricultural Officer in charge of this work spent much of his leave investigating this question and was instrumental in getting for Nigeria a definite quota of both net cord and machine-made nets but it is clear that the shortage is likely to continue until after the war. A few nets which he obtained primarily for experimental fishing were snapped up by the fishermen as soon as they arrived.

138. The whole programme of fishing investigation to date was reviewed during the course of the year and a comprehensive report with suggestions for further work was submitted by the Fishery Officer. This report was submitted to the Colonial Fisheries Advisory Committee at the Colonial Office and the general lines of past investigation received the approval of the Committee. The latter however stressed the need for a great deal more research. It suggested the need for both a research station and for a local fisheries service and suggested that fundamental research might be carried out by Research Officers appointed and paid from Imperial Funds ; these men would work for a period in Nigeria and return to United Kingdom for analysis of their results ; the Local Fishery Service would be paid from Nigerian funds and be responsible to the local Government. It was proposed that the local service would administer the fisheries under the guidance of the Research Staff. It is understood that the Adviser on Fisheries to the Colonial Office has recommended, subject to approval by the Nigerian Government, that a permanent sub-station for Marine and Lagoon Fisheries Research might well be established in Lagos.

139. In the meantime the Fishery Officer, in addition to maintaining records essential to laying the foundation for more advanced research, has commenced work at Lagos on tidal fish farms. If these fish farms are successful they may have a wide application throughout the creeks and lagoons of the Nigerian coast. They are simple to make, cheap to maintain, and the profits should be considerable. The future of this experiment cannot be foretold as it may be subject to limiting factors such as the removal of the fish by birds or stolen by people before they fully mature, but a promising start has been made. In connection with this work a small temporary laboratory has been established for the study of the growth rate of various species with a view to ascertaining the species which grow most quickly to a marketable size.

LOCAL INDUSTRIES

140. Among the successful small local industries fostered by the Department may be mentioned Split Peas, Rope and Twine, Baskets and Dried Onions. One of the most important features of the Split Pea industry is that by providing a market for the peas the people are being encouraged to grow Pigeon peas, a crop which is of great value in connection with soil fertility. The basket industry is of importance because it provides the containers for the potato industry. No less than 36,900 baskets were supplied from the Gogwada area of the Zaria Province. The rope and twine industry in the

Bida area alone has benefited the producers to the extent of £18,300. The Yawa fibre from which one of the types of twine is made has received very favourable reports as a material for paper making. The production of dried onions, either by sun drying or by dehydration, has great possibilities and may yet become an important industry. The production of onions in the Northern Provinces is estimated at not less than 3,200 tons.

DEHYDRATION

141. Local investigation into this subject began in 1942 when Mr. B. G. Owen, Senior Agricultural Officer, visited the Kerigoya and Karatina Dehydrated Vegetable Factories in Kenya, East Africa. The latter factory was not then completed but at Kerigoya much information was collected. A subsequent survey of possibilities in Nigeria disclosed that the only really suitable place for such a factory was at Bamenda in the British Cameroons. Owing to the then changed military situation, the Army authorities who were the immediate potential customer suggested that there was no need to proceed further. In September, 1943, Mr. Owen met the United Kingdom Dehydration Mission in Nigeria and as a result of their enquiries and his further investigations while on leave, a scheme for dehydrating onions in Nigeria is now under consideration while information has also been gained about the dehydration of meat, a somewhat more difficult project but one which is being kept in mind.

ECONOMIC GARDEN

142. One of the interesting features of the Economic Garden is the success of the "Balsa" wood trees, two of which were planted in May, 1941. They now have a girth of 3½ feet and have grown to a height of forty-five feet. These trees produce an exceptionally light wood which is used in aeroplane construction. They also produce a soft fawn-coloured form of Kapok.

STAFF

143. I record with pleasure the appointment of our first African Agricultural Officer. Every effort will be made to fit other members of the staff for promotion to this post. The promise of several members of the African Staff as a result of increased responsibilities is a very pleasing feature.

ACKNOWLEDGMENT

144. I again wish to acknowledge the splendid work of all members of the Department and to express my appreciation for the loyalty which has made possible the teamwork upon which the effectiveness of the Department so largely depends.

J. R. MACKIE,
Director

Agricultural Department, Ibadan,
10th August, 1944.